WHAT IS CLAIMED IS:

1. A network element operable in an Internet Protocol (IP) network, comprising:

at least one terminating line card operable as an ingress card supporting an incoming communications link;

at least one terminating line card operable as an egress card supporting an outgoing communications link;

a switch fabric disposed between said ingress and egress cards for supporting a plurality of virtual ingress/egress pipes (VIEPs) therebetween, wherein said ingress and egress cards are provided with a plurality of buffer queues to support traffic flows associated with said VIEPs;

a policing structure disposed on said ingress card for monitoring incoming traffic on said incoming communications link with respect to an expected traffic profile associated with said incoming traffic;

a flow controller disposed on each of said ingress and egress cards, said flow controllers operating to manage said traffic flows associated with said VIEPs through said switch fabric, wherein said traffic flows are operable to be effectuated with resource reservations allocated in said switch fabric; and

a scheduler disposed on said egress card for scheduling and shaping outgoing traffic on said outgoing communications link.

2. The network element operable in an IP network as set forth in claim 1, wherein said policing structure, said flow controllers, and said scheduler operate in concert with a plurality of counters associated with said ingress and egress cards to provide Quality of Service (QoS) parametric information necessary to effectuate a Service Level Agreement between a network service provider operating said network element and a subscriber for services available in said IP network.

3. The network element operable in an IP network as set forth in claim 2, wherein each of said flow controllers is associated with at least one local congestion indicator, and further wherein each of said flow controllers operate in conjunction with a packet discarding mechanism for throttling flow on a particular VIEP.

4. The network element operable in an IP network as set forth in claim 3, wherein said packet discarding mechanism associated with said flow controller on said ingress card is operable to be controlled at least in part by a feedback signal received from said at least one local congestion indicator disposed on said egress card.

5. The network element operable in an IP network as set forth in claim 3, wherein said plurality of buffer queues are categorized as one of real time (RT) and non-real time (NRT) queue types.

6. The network element operable in an IP network as set forth in claim 5, wherein said plurality of counters associated with said ingress card include a counter for monitoring the number of packets transferred per egress card per queue type.

7. The network element operable in an IP network as set forth in claim 5, wherein said plurality of counters associated with said ingress card include a counter for monitoring the number of bytes transferred per egress card per queue type.

8. The network element operable in an IP network as set forth in claim 5, wherein said plurality of counters associated with said ingress card include a counter for monitoring the number of packets dropped per egress card per queue type.

9. The network element operable in an IP network as set forth in claim 5, wherein said plurality of counters associated with said ingress card include a counter for monitoring the number of bytes dropped per egress card per queue type.

10. The network element operable in an IP network as set forth in claim 5, wherein said QoS parametric information comprises traffic flow throughput information per Class of Service (CoS) per destination.

11. The network element operable in an IP network as set forth in claim 5, wherein said QoS parametric information comprises traffic loss ratio per Class of Service (CoS) per destination.

12. The network element operable in an IP network as set forth in claim 5, wherein said QoS parametric information comprises queuing delay information.

13. The network element operable in an IP network as set forth in claim 12, wherein said queuing delay information comprises average depth of said buffer queues on said ingress and egress cards.

14. The network element operable in an IP network as set forth in claim 5, wherein said QoS parametric information comprises traffic flow jitter information.

15. The network element operable in an IP network as set forth in claim 14, wherein said wherein said QoS parametric information comprises available bandwidth per link.

16. The network element operable in an IP network as set forth in claim 5, wherein said plurality of counters associated with said egress card include a counter for monitoring the number of packets transmitted per egress card per queue type for each neighboring element associated with said network element in said IP network.

17. The network element operable in an IP network as set forth in claim 5, wherein said plurality of counters associated with said egress card include a counter for monitoring the number of bytes transmitted per egress card per queue type for each neighboring element associated with said network element in said IP network.

18. The network element operable in an IP network as set forth in claim 5, wherein said plurality of counters associated with said egress card include a counter for monitoring the number of packets dropped per egress card per queue type for each neighboring element associated with said network element in said IP network.

19. The network element operable in an IP network as set forth in claim 5, wherein said plurality of counters associated with said egress card include a counter for monitoring the number of bytes dropped per egress card per queue type for each neighboring element associated with said network element in said IP network.

20. The network element operable in an IP network as set forth in claim 5, wherein said plurality of counters associated with said egress card include a counter for monitoring average queue depth of said buffer queues per egress card.

21. The network element operable in an IP network as set forth in claim 5, wherein said plurality of counters associated with said egress card include a counter for monitoring the number of times a particular buffer queue crosses a packet discard threshold associated therewith.

22. A method for processing Quality of Service (QoS) parametric information in a network element operable in an Internet Protocol (IP) network, wherein said network element includes at least one terminating line card operable as an ingress card supporting an incoming communications link, at least one terminating line card operable as an egress card supporting an outgoing communications link and a switch fabric disposed between said ingress and egress cards for supporting a plurality of virtual ingress/egress pipes (VIEPs) therebetween, comprising the steps of:

receiving incoming information on said incoming link of said network element;

determining in an ingress portion a network processor system disposed on said ingress card whether said incoming information pertains to an IP-based service;

responsive to said determining step, propagating said incoming information to an egress portion of said network processor system via said switch fabric, said egress portion including an embedded processor operable to perform a plurality of IP-based QoS (IPQoS) monitoring operations and for processing said incoming information into processed information; and

transmitting said processed information to said egress card via a select VIEP for routing said processed information on said outgoing link to a neighbor in said network.

23. The method for processing QoS parametric information in a network element operable in an IP network as set forth in claim 22, wherein said IPQoS monitoring operations include policing said incoming information at said ingress card.

24. The method for processing QoS parametric information in a network element operable in an IP network as set forth in claim 23, wherein said policing step comprises measuring said incoming information against an expected behavior profile associated therewith.

25. The method for processing QoS parametric information in a network element operable in an IP network as set forth in claim 22, wherein said IPQoS monitoring operations include a plurality of flow control steps for effectuating bandwidth management for said switch fabric.

26. A Quality of Service (QoS) monitoring system for a network element operable in an Internet Protocol (IP) network, wherein said network element includes at least one terminating line card operable as an ingress card for supporting an incoming communications link, at least one terminating line card operable as an egress card for supporting an outgoing communications link and a switch fabric disposed between said ingress and egress cards for supporting a plurality of virtual ingress/egress pipes (VIEPs) therebetween, comprising:

a policing structure associated with said ingress card for monitoring incoming traffic on said incoming communications link with respect to an expected traffic profile associated with said incoming traffic;

a buffer acceptance and flow control module associated with each of said ingress and egress cards, said buffer acceptance and flow control modules operating to manage traffic flows associated with said VIEPs through said switch fabric, wherein said traffic flows are operable to be effectuated with resource reservations allocated in said switch fabric; and

a traffic shaping and scheduling module associated with said egress card for scheduling and shaping outgoing traffic on said outgoing communications link.

27. The QoS monitoring system for a network element operable in an IP network as set forth in claim 26, wherein said policing structure, said buffer acceptance and flow control modules, and said traffic shaping and scheduling module operate in concert with a plurality of counters associated with said ingress and egress cards to provide QoS parametric information necessary to effectuate a Service Level Agreement between a network service provider operating said network element and a subscriber for services available in said IP network.

28. The QoS monitoring system for a network element operable in an IP network as set forth in claim 27, wherein each of said buffer acceptance and flow control modules is associated with a local congestion indicator for effectuating a packet discard mechanism to throttle buffers queues corresponding to said traffic flows in said switch fabric.

29. The QoS monitoring system for a network element operable in an IP network as set forth in claim 28, wherein said buffer acceptance and flow control module associated with said ingress card is operable to be controlled at least in part by a feedback control signal generated by said egress card's local congestion indicator.

30. The QoS monitoring system for a network element operable in an IP network as set forth in claim 29, wherein said feedback control signal comprises a per-flow congestion threshold value.